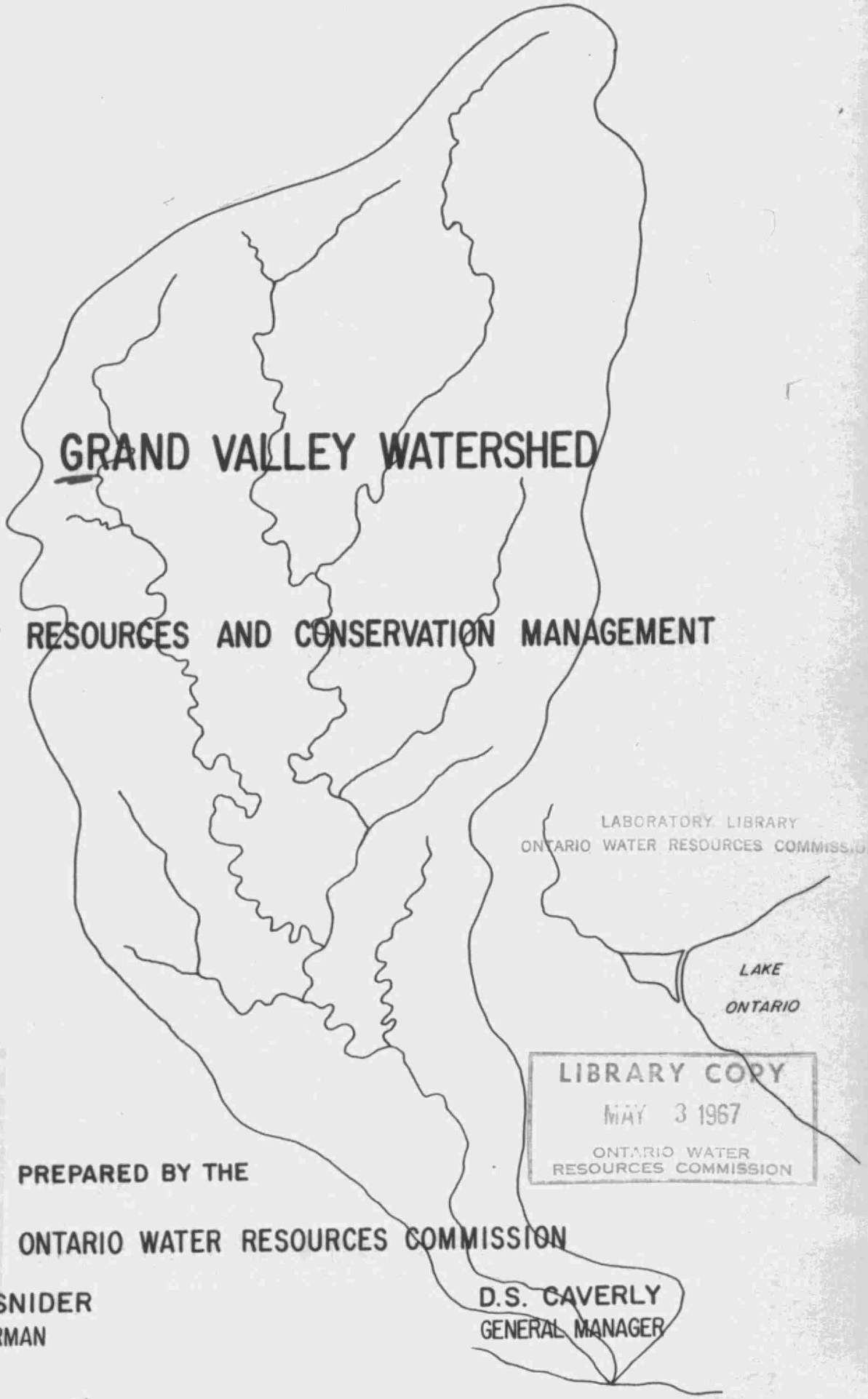
GRAND VALLEY WATERSHED

WATER RESOURCES AND CONSERVATION MANAGEMENT



PREPARED BY THE

ONTARIO WATER RESOURCES COMMISSION

A.M. SNIDER
CHAIRMAN

D.S. CAVERLY
GENERAL MANAGER

THE STORY OF A WATERSHED

The Grand River watershed is located in the easterly part of southwestern Ontario. It comprises practically the whole of the counties of Waterloo, Wellington and Brant, and parts of Grey, Dufferin, Perth, Halton, Oxford, Wentworth, Norfold and Haldimand; and contains the City of Brantford, Galt, Guelph, Kitchener and Waterloo. It includes six towns, 12 incorporated villages, several important hamlets and 48 townships. The urban centres have many varied and thriving industries and the farms and soils of the rural areas are among the best in the Province. It has an overall length of 118 miles, an average width of 22 miles, an area of 2,614 square miles, and is the most densely populated of any of similar size area in Canada.

The head waters of the Grand are located in the high tableland where the villages of Belwood and Dundalk are located, just 19 miles south of Georgian Bay. This high tableland is where the head waters of several rivers begin, the Nottawasaga, Beaver, Sydenham, Maitland, the only branch of the Thames River, as well as the Grand and its tributaries.

The greater part of this tableland was, originally, swamp land which has since been drained and most of which is now under cultivation. Owing to its high altitude, it is subject to low temperatures and heavy snowfall during the winter months.

The most important tributaries of the Grand River are the Conestoga, Nith, Speed and Eramosa rivers and Whitman, Fairchild, McKenzie, Boston and Big creeks.

The Grand River rises about five miles northeast of Dunnville, but its course is southerly as far as Paris where it swings southeasterly and empties into Lake Erie at Port Maitland. Its length is about 180 miles, and its drop from head waters is about 1,165 feet.

The Conistoga River has two branches at its head waters. One branch rises about 10 miles north, andthe other branch is 10 miles northwest of Arthur. It flows southwesterly for one half of its course and thence southeasterly, joining the Grand River 25 miles north of Galt. Its length is about 51 miles and its fall from head waters is about 550 feet.

The Nith River rises about five miles southeast of the Town of Listowel. It has a long winding course in a general southeasterly direction, joining the Grand River at the Town of Paris. Its length is about 98 miles and the total fall from head waters is about 650 feet.

The Speed River rises 18 miles north of Guelph, flows southerly and joins the Grand about 3½ miles above Galt, its length is 37 miles and the total fall from head waters is about 570 feet.

The Eramosa River rises near the hamlet of Orton, flows southerly throughout most of its course and then turns west to join the Speed River at Guelph. Its length is about 23 miles and the total fall from head waters is 410 feet.

Water Quality and Floods

Floods are a natural phenomena which may occur on any river system, however well forested the area is through which the river flows, and a point may be reached when the ground has absorbed all the moisture it can hold. When this is the case, rain or melting snow must find its way directly into the streams. If the volume is too great, some degree of flooding will result and at intervals this will be sufficient to cover the whole flood plain of the river to a considerable depth.

Conditions which cause floods may be grouped in two general classifications. The first are geophysical, which are permanent, second are climatic, which are variable. The geophysical factors are constant and are such as tend to produce a high rate of run-off. The climatic factors are extremely complex and variable depending largely upon the amount of snow cover, temperature, amount of rainfall and the direction and the velocity of the wind. In addition, there is the third factor of encroachment of the works of man into the natural flood channel of a river. Remedial measures for flood control include proper land use practices, reforestation, farm pond development and reservoir storage. These conservation measures not only control floods, but can be used to increase low flows in the watercourse.

For many years the municipalities of the Grand River placed a constant strain on the ground water resources of the Valley to support the increasing demands of growth. As no other alternative was available to them, the common practice for many years was to discharge the domestic and industrial wastes without treatment or without adequate treatment.

As a result, the use of the stream for water supplies and recreation was almost lost.

The problem of polluted water entering clear water sources, during floods, and the inability of the stream to properly reclaim the waste discharges from the communities, during periods of low flow, is of great import. Also important is the problem of flooding. The Grand had both problems.

So corrective measures were and still are being taken. Programs of flow regulation, flood and pollution control are now well underway.

Through the combined efforts of the Ontario Department of Lands and Forests, the Grand Valley Conservation Authority, the Grand Valley Conservation Commission, the Government of Canada, the numerous individual municipalities concerned, and the Ontario Water Resources Commission, the rivers of the Grand Valley Watershed are returning to the condition nature endowed upon them before man and his increasing demands interfered. Now man is trying to rectify the results of his earlier mistakes.

POLLUTION CONTROL SYSTEMS IN THE WATERSHED

Arthur

The Village of Arthur, with the assistance of the OWRC, has constructed a water pollution control system consisting of sewers, pumping station, and a two-cell stabilization lagoon. The design capacity of this installation is 100,00 gallons per day.

Brantford

The City of Brantford, with the assistance of the OWRC, constructed an activated sludge process, pollution control plant in 1959. The plant provides biological, secondary treatment. Vacuum filters are utilized to reduce handling costs in the final disposal of sludge. The design capacity of the plant is 12,500,000 gallons per day.

Caledonia

The Village of Caledonia constructed an activated sludge process, pollution control plant in 1955. This plant provides biological secondary treatment. The plant capacity is 150,000 gallons per day.

Fergus

The Town of Fergus, with the assistance of the OWRC, constructed an acitivated sludge process pollution control plant in 1960. This plant provides biological secondary treatment. The design of the plant is 260,000 gallons per day.

Galt

In 1962, the City of Galt, with the assistance of the OWRC, enlarged their existing pollution control plant, built in 1948, to provide biological secondary treatment. The present capacity of the plant is 5,000,000 gallons per day.

Guelph

The City of Guelph constructed an activated sludge process pollution control plant in 1934, and enlarged this plant in 1958 to 6,000,000 gallons per day. This plant provides biological secondary treatment.

Kitchener

The City of Kitchener originally constructed two plants during the 1920's. One, in the Spring Valley area, and the other in the Doon area. In 1959, with the assistance of the OWRC, the Spring Valley plant was demolished and a pumping station was constructed to discharge the waste water from this area to the Doon Plant. The Doon plant was enlarged in capacity to 11.5 million gallons per day, providing primary treatment with biological treatment and vacuum filtering of the sludge. In 1963, again with OWRC assistance, the Doon plant was again extended to provide full biological secondary treatment. The mechanical aeration section of this plant is the largest of its type in Canada at present. The capacity of the plant has been increased to 13.5 million gallons per day.

New Hamburg

The Village of New Hamburg, with the assistance of the OWRC, constructed in 1962, a water pollution control system consisting of sewers, pumping station, and a two-cell stabilization lagoon. The design capacity of this system is 150,000 gallons per day.

Paris

The Town of Paris, with the assistance of the OWRC, constructed a total oxidation process, pollution control plant in 1962. The plant provides biological secondary treatment. The design capacity isl,100,000 gallons per day.

Preston

The Town of Preston, with the assistance of the OWRC, constructed an acitivated sludge process, pollution control plant in 1962. The plant provides biological secondary treatment for the removal of waste materials and vacuum filtration of the raw sludge. The design capacity is 1,800,000 gallons per day.

Waterloo

In 1959, the City of Waterloo enlarged its primary pollution control plant, with the assistance of the OWRC, to provide treatment by the activated sludge process. The plant now provides biological secondary treatment for the removal of waste materials and vacuum filtration of raw sludge. The design capacity is 4,000,000 gallons per day.

Planned Works

Water pollution control projects proposed or in the process of preparing plans are in the following communities:

Elmira

An activated sludge process, pollution control plant is proposed for this municipality and is presently having plans prepared. The plant capacity will be 680,000 gallons per day.

Elora

A total oxidation process pollution control plant is planned for this municipality, having a capacity of 100,000 gallons per day.

Milverton

A stabilization lagoon pollution control system is proposed for this municipality.

Wilmot Twp. (Baden)

A stabilization lagoon water pollution control system is proposed for this municipality.

- - - - - - - - - - - - - - - - - -

The 1962 Grand River watershed population was 358,721 persons, of which 68% or 244,500 persons are serviced by water pollution control plant facilities.

WATER SUPPLY SYSTEMS IN THE WATERSHED

Of the 22 incorporated municipalities in the Grand River drainage area, 18 have municipal waterworks systems. Fourteen of the communities obtain their supply from ground-water sources, (wells and springs). Brantford and Cayuga obtain its water directly from the Grand River. Dunnville formerly obtained its water from the Grand, but in 1960, upon the completion of the OWRC Dunnville Regional Water Supply System, its water supply has been from Lake Erie.

The well and spring water supplies are free of bacterial contamination and require no treatment for this purpose. In the case of spring supplies, chlorination is carried out and this is done in the communities of Paris, Preston, New Hamburg and Guelph. Chemical quality of the ground-water resources varies slightly from area to area in the Valley, and common problems of coloured water, tastes, odours, and aggressive water are, and have been experienced in the majority of communities. Iron bacteria have been isolated in the distribution systems of most municipalities in the area.

Dundalk

The source of supply is from two deep drilled wells. Both wells pump to a 1,500 gallon pressure tank, and then directly to the system.

Chemical Quality:

Well No.	Hardness	Iron
1	230	0.24
2	274	2.8

Arthur

This community has three wells and a pressure storage capacity of 50,000 gallons. There is no treatment of the water.

Chemical Quality:

Well No.	Hardness	Iron
1	772	2.0
2	264	0.15
3	148	0.13

The fluoride content of these wells ranges from o.8 to 1.1 ppm.

Fergus

The town has two deep drilled wells with no treatment on one and sodium hypochlorite and calgon added to the water on the other. This is done to discourage the growth of iron bacteria and sequester the iron content. Storage is provided in a 208,000 gallon elevated tank.

Chemical Quality:

Well No.	Hardness	Iron
1	550	0.22
2	460	1.80

The fluoride content of the water ranges from 0.4 ppm in well No. 2 to 0.6 in well No. 1.

Elora

The water system is supplied from two deep drilled wells with calgon addition and chlorination treatment being provided. Well No. 2 is further treated with sodium hypochlorite to sequester the high iron content and control the growth of iron bacteria. Storage is provided in a 124,000 gallon elevated tank.

Chemical Quality:

Well No.	Hardness	Iron	Sulphate
1			
2	558	0.1	370

The fluoride content of the water is 0.4 ppm.

Elmira

The source of supply is from three drilled wells and no treatment is provided. Storage is provided in a 600,000 gallon ground level reservoir and a 30,000 gallon elevated tank.

Chemical Quality:

Well No.	Hardness	Iron	Sulphate
2	532	1.80	285
5	504	0.16	302
6	504	0.96	

Waterloo

The source of supply is from six deep drilled wells. No treatment is provided. Water storage consists of four underground reservoirs with a total capacity of 1,035,000 gallons, a 500,000 gallon elevated tank and a 285,000 gallon standpipe.

Chemical Quality:

Well No.	Hardness	Iron
1	514	0.56
2	500	0.22
3	1630	1.46
4	310	0.13
5	564	1.36
6	262	0.32

Kitchener

The source of supply is from 22 deep drilled wells located in four well fields. No treatment is provided. Ground level storage capacity is 9,500,000 gallons and pressure storage capacity is provided by a 5,000,000 gallon elevated tank, a 830,000 gallon steel tower, and a 500,000 gallon concrete tower.

Chemical Quality:

Hardness ranges from 264 to 488; iron ranges from a trace to 0.56 and there are traces of fluoride in only a few of the wells. A few of the wells exceed the limits for iron and total solids content, but generally the quality is satisfactory.

Guelph

The source of supply is from 12 deep wells and Arkell springs. The main source of supply is the Arkell springs which issue from a bank of gravel adjoining the Eramosa River. No treatment is provided to the well sources but the spring waters are chlorinated. Storage is provided by two 500,000 gallon reservoirs and a 500,000 gallon standpipe.

Chemical Quality:

The chemical quality of Arkell; hardness 278, iron 0.10, total solids 330. The well sources range as follows: Hardness 230 - 468, iron 0.05 - 1.52, total solids 308 - 724. Iron removal treatment is presently being considered at well No. 12 and further system treatment consisting of aeration, settling, calgon addition and chlorination are in the design stage.

Hespeler

Source of supply is six deep drilled wells. Water from wells 2 and 3 is aerated, settled and chlorinated, to remove hydrogen sulphate gas, and chlorination has been practiced in the past on well No. 3, to discourage the growth of iron bacteria. The remaining sources are not treated. Storage is provided by a 230,000 gallon underground reservoir and a 100,000 gallon elevated tank.

Chemical Quality:

Well No.	Hardness	Iron
1 & 2	418	0.24
3	278	0.1
4	318	0.1
5	264	0.1
6	366	0.38

Preston

The source of supply is six deep-drilled wells and two springs. The spring supply of wells No. 2 and 3 are chlorinated. Storage is provided by a 127,000 gallon standpipe, a 1,500,000 gallon prestressed cement reservoir and two ground level reservoirs with capacities of 100,000 gallons and 200,000 gallons, Fluoride content ranges from 0.3 to o.7.

Chemical Quality:

Well No.	Hardness	Iron
2	416	0.06
4	308	0.10
5	822	0.12
6	284	0.27
7	344	0.16
9	262	0.22
Upper Spring	272	0.20
Lower Spring	280	0.16

Galt

The source of supply is from eight deep-drilled wells. No treatment is provided. Storage is provided by two standpipes with capacities of 220,000 gallons and 780,000 gallons and two ground reservoirs with capacities of 2,500,000 gallons and 150,000 gallons.

Chemical Quality:

Well No.	Hardness	Iron	Total Solids
1	462	0.08	658
2	364	0.05	534
3	392	0.10	542
4	332	0.10	426
5	515	0.13	580
6	292	0.10	418
7	280	3.40	384
8	266		

Fluoride content ranges from 0 to 1.0.

New Hamburg

The source of supply is from springs which are chlorinated before use. Storage is provided by a 120,000 gallon standpipe.

Chemical Quality:

Well No.	Hardness	Iron
Spring	232	0.16

Fluoride content is 0.1.

Paris

The source of supply is two springs with a drilled well in each spring area. Chlorine treatment is provided.

Chemical Quality:

	Hardness	Iron
Spring Area No. 1	274	0.05
" " " 2	310	0.05

The water in the springs contains no fluoride.

Brantford

The supply is obtained from the Holmdale waterworks canal which is a tributary of the Grand River. Extensive treatment is provided including pre-treatment, aeration, mixers, floculation and filtration, with chemical coagulants being used to remove colloidal and dissolved substances.

Chemical Quality:

	Hardness	Iron	Fluoride
Raw Water	2000	0.43	0.0
Treated Water	250	0.30	1.2

Sodium silico fluoride is added after filtration to maintain a treated water fluoride content of 0.8 to 1.2ppm.

Caledonia

The source of supply is from three drilled wells. The water is gas chlorinated before use to discourage the growth of iron bacteria. Storage is provided by a 50,000 gallon elevated tank.

Chemical Quality:

Well No.	Hardness	Iron	Fluoride
1	1330	0.16	0.4
2	990	0.16	0.6

Cayuga

Cayuga is one of the two municipalities utilizing the Grand River as a source of supply.

Storage is provided by a 185,000 gallon standpipe.

Chemical Quality:

	Hardness	Iron
Raw Water	278	0.36
Treated Water	276	0.10

Dunnville

The source of supply is obtained from Lake Erie, with the Grand River used for emergency purposes. The Lake Erie water receives micro-straining and chlorination before arriving at the Dunnville plant.

Chemical Quality:

	Hardness	Iron
End of OWRC main	144	0.10

WATER USE IN GRAND RIVER WATERSHED

Cities and Towns		Source	Average Consumption
Brantford	--	(Grand River)	6,100,000 GPD
Caledonia	--	(Wells)	200,000 GPD
Dunnville	--	(Lake Erie)	1,000,000 GPD
Elmira	--	(Wells)	1,500,000 GPD
Elora	--	(wells)	400,000 GPD (est.)
Fergus	--	(wells)	400,000 GPD
Galt	--	(wells)	3,560,000 GPD
Guelph	--	(springs and wells)	5,083,000 GPD
Hespeler	--	(wells)	600,000 GPD
Kitchener	--	(wells)	7,200,000 GPD
New Hamburg	--	(springs)	225,000 GPD
Paris	--	(springs and wells)	519,300 GPD
Preston	--	(springs and wells)	1,200,000 GPD
Waterloo	--	(wells)	2,000,000 GPD
Port Maitland (Industrial)	--	(Lake Erie)	12,000,000 GPD

GRAND VALLEY CONSERVATION AUTHORITY

This Authority was established in February of 1948, and involves 71 municipalities with 83 members. The Chairman is D. Disher, Dunnville; the Vice-Chairman is J.S. Bauer, Waterloo, and the Secretary-Treasurer and Field Officer is G.M. Couttes, Galt.

This Authority is working on a programme of flood control and is active in the agricultural implementation of conservation measures throughout the rural districts of the watersheds.

The Authority is a corporate body similar to a county organization, consisting of a chairman, vice-chairman, secretary-treasurer and 12 executive members. The Authority has the powers of expropriation and the power to levy on member municipalities for money required for administration and capital projects.

Projects under study are located in the Fairchild, Speed, Eramosa and Whiteman watershed areas.

The following conservation parks have been developed and are open to the public:

Byng Island Park	(135 acres)
Doon Pioneer Village	(53 acres)
Elora Gorge Park	(305 acres)
Pinehurst Park	(110 acres)
Rockwood Park	(197 acres)

There are presently 48 reforestation areas planted through the assistance of the Authority, ranging in areas from 50 to to 400 acres.

Land use demonstrations have been carried out in the Elora Conservation Area and Oneida and Boyd Demonstration Farms to demonstrate gully control, farm ponds, grass waterways, tile drainage, pastures and reforestation.

A land acquisition programme was started in 1951 which provides for the purchase of land tracts, under agreement with the Department of Lands and Forests for timber production, wildlife management and research. Land investment to 1962 was $111,966.00 for 4,757 acres.

A farm pond programme was established in 1953, with the Authority supplying the planning and engineering. Assistance is also provided for community pond upkeep.

Schemes, such as channel improvements, dams for flood control and recreation, flood plain mapping and general development projects, are in various stages of completion, preparation or planning.

A private tree planting assistance programme, started in 1953, provides men and equipment, free of charge, to landowners. As of 1962, approximately 2,000,000 trees had been planted, which represents approximately 2,000 acres.

MUNICIPALITIES IN GRAND RIVER WATERSHED REPRESENTED IN THE GRAND VALLEY CONSERVATION AUTHORITY

CITIES:

Brantford
Galt
Guelph
Kitchener
Waterloo

TOWNS:

Dunnville
Elmira
Fergus
Hespeler
Paris
Preston

VILLAGES:

Arthur
Ayr
Bridgeport
Caledonia
Cayuga
Clifford
Drayton
Dundalk
Elora
Grand Valley
Milverton
New Hamburg

TOWNSHIPS:

Amaranth
Arthur
Beverly
Blandford
Brantford
Blenheim
Burford
Canboro
Cayuga N.
Cayuga S.
Dumfries N.
Dumfries S.
Dunn
Easthope N.
Easthope S.
Ellice
Elma
Eramosa
Erin
Esquesing
Garafraxe E.
Garafraxa W.
Guelph
Luther E.
Luther W.
Maryborough
Melancthon
Mornington
Moulton
Nassagaweya
Nichol
Oakland
Oneida
Onondaga
Oxford E.
Peel
Pilkington
Proton
Puslinch
Seneca
Sherbrooke
Townsend
Wallace
Waterloo
Wellesley
Wilmot
Woolwich
Zorra E.

GRAND RIVER CONSERVATION COMMISSION

This Commission was established in 1938 by a special act of the Ontario Legislature. Membership consists of eight municipalities. The Chairman is G.E. Fisher, Galt; the Vice-Chairman is R.A. Pequegnat, Kitchener; and the Secretary-Treasurer is I. Kao, Fergus. This Commission works independently of the Authority.

The Commission's maintenance and operating management budget amounts to approximately $150,000 annually. This sum is spent as follows:

1. Reforestation and woodlot management - $36,000
2. Operating expenses and maintenance - $94,000
3. Administration - $20,000

The revenue is derived from the following sources:

1. Rentals and woodlot sales - $40,000
2. Municipal participation - $110,000

Use of Commission lands includes forestry management, forestry nurseries and cottage site rentals.

The reforestation activities of the Commission are confined to the Commission-owned areas around the conservation lakes.

Projects in Operation and Administered by the Commission:

Luther Dam 1953 $233,806.00

- 930ft. earth dam rising 19 feet above stream bed.
- 4,500 acres flooded.
- 10,000 acre-ft. storage capacity.

Shand Dam and Belwood Lake 1942 $2,056,490.00

- 3/4 mile earth fill dam with 80 ft. high concrete section.
- Surface area 1,829 acres.
- Storage capacity 49,600 acre-ft.

Conestoga Dam 1958 $5,400,000.00

- 1,790 ft. earth dam with 95 ft. length concrete spillway.
- Surface area 1,816 acres
- storage capacity 45,060 acre- ft.

Projects Presently Under Active Planning and Consideration

Montrose Lake
Ayr Lake

MUNICIPALITIES REPRESENTED
In the
GRAND RIVER CONSERVATION COMMISSION

Brantford	Kitchener
Elora	Paris
Fergus	Preston
Galt	Waterloo

	DATE DUE		